Original Research

Determinants of Dental Pain in a Rural Area of Indonesia during the Second Wave of COVID-19 Pandemic: A Cross-sectional Study

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Abstract

Aim: To assess the prevalence and the association between dental pain and sociodemographic characteristics, oral health behavior, and coronavirus disease-19 (COVID-19) responses in a rural area of Indonesia during the second wave of the COVID-19 pandemic. **Materials and Methods:** This cross-sectional study randomly selected 296 participants aged 17 years and older in Kalisat, Jember, Indonesia. An interviewer-administered questionnaire was used to measure the variable of interest. The dental pain as an outcome variable was based on the dental pain experience from the past 2 months. A logistic regression model of 12 independent variables, including sex, age, ethnicity, education, occupation, income, insurance, toothbrush frequency, snacking, fear of COVID-19, government aids, and vaccination status, was applied to find the determinants of dental pain. **Results:** In the second wave of the pandemic, 25.3% of the participants reported dental pain. The increasing level of fear was significantly related to having more experience with dental pain. The most significant predictor of dental pain was having an "often" fear of COVID-19 (odds ratio, OR = 5.23; $P = 0.004$). The older age groups were more likely to report dental pain than the 17–25 age group, and the most significant association was 56–65 years (OR = 5.26; $P = 0.015$). **Conclusions:** The oral health programs should consider the psychological factors and pay attention to the older age groups during the COVID-19 pandemic.

Keywords: COVID-19, Dental Pain, Oral Health

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Introduction

The world faces the worst crisis because of the second wave of the coronavirus disease-19 (COVID-19), and the pathogenesis is severe globally compared with the first wave because of the mutations and virulence of the virus. The WHO reported 414,525,183 confirmed cases of COVID-19 infection and 5,832,333 COVID-19 deaths on February 13, 2022.[1] Indonesia experienced the peak cases in this second wave of the COVID-19 pandemic, even though the implementation of the COVID-19 vaccination program started in January 2021.[2] On June 21, 2021, there was a 381% increase in cases in Indonesia, and several parties called it the new epicenter of the pandemic.[3,4] The risk of COVID-19 transmission was reduced through various health protocols and restrictions on health services. Furthermore, in response to this condition, the Indonesian government announced new emergency restrictions toward community activities, starting on July 1, 2021.[4]

The COVID-19 pandemic affected the health of the population in many ways. People were reported to have changed their health behavior during this period. They gave more attention to their health, brushed their teeth more often, and smoked less.[5] This pandemic also

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impacted the psychology of the health service providers and the community.[6-8] Furthermore, many dental and oral health services were closed or limited to emergency cases because of the actions in dentistry that triggered the creation of aerosols, which were at the risk of transmitting the virus.[9]

The common oral health problem during this COVID-19 pandemic was dental pain. According to a study among Brazilian and Chinese Twitter users, dental pain was the most mentioned dental treatment needed during the pandemic.[10,11] Another study showed 43.3% of people at a university hospital in Germany requested dental appointments because of the oral health problem.[12] Additionally, dental pain negatively affects the quality of life, such as eating habits, mood, sleep, and social functions.[13-15]

As the most reported oral health problem, dental pain was related to several social factors,[16] including place of residence, which influences the difference in health outcomes. The rural area is a challenging cultural, social, and geographical context for oral health outcomes.[17] Furthermore, people in rural areas rely on community-based health services close to their homes.[18] Understanding the factors related to dental pain helps give information about the community health risk.

There is a limited study on oral health during the second wave COVID-19 in the rural areas, which considers several factors related to oral health problems. Therefore, the purpose of this study is to examine the prevalence of dental pain during the second wave COVID-19 pandemic and seek its determinants in a rural area of Indonesia by analyzing sociodemographic factors, oral health behavior, and responses to COVID-19.

Materials and Methods

Study design, setting, and participants

This study is a cross-sectional analytical observational research to determine the factors associated with dental pain during the second wave of the COVID-19 pandemic in a rural area in Indonesia. Data were collected on September 2021 in the subdistrict of Kalisat, district of Jember, Province of Jawa Timur, Indonesia. This subdistrict was classified as a rural area based on the Statistics Indonesia classification, where the total population in Kalisat was 74,962.[19] The sample size was calculated using OpenEpi version 3. The minimum sample size to conduct this research is 383, with a confidence level and error margin of 95% and 5%, respectively.

The study sample was recruited through a two-stage random sampling. At the first stage, participants were selected randomly from five villages in Kalisat, including Plalangan, Pertempuran, Sumber Kalong, Sumber Ketempah, and Gambiran. These five villages were randomly obtained from a total of 12 villages. At the second stage, the sample size was divided proportionally based on the population size in every village. The inclusion criteria included those 17 years and older, permanent residence of Kalisat, and willingness to participate by providing informed consent. Meanwhile, the exclusion criteria for participants were younger than 17 years, not a permanent residence of Kalisat, and not willing to participate in this study. In total, 396 respondents participated in this study.

Variables

Dental pain was collected as an outcome variable from the respondents by asking the question, "Did you ever experience dental pain in the last 2 months (since July 2021)?". This variable is a binary variable containing yes and no answers.

The determinants of dental pain examined include sociodemographic characteristics including sex, age, ethnicity, education, employment, monthly family income, and health insurance; oral health behavior comprising of toothbrushing frequency and sugary snack habits; and COVID-19 related factors consisting of government aid during pandemic, vaccination status, and fear of the coronavirus infection.

Data collection and measurement

The interviewers visited the households and conducted a direct interview with respondents to collect the data. The interviewers received 1-day training on the questionnaire before data collection to reduce interviewer variability. In this training, the interviewer practiced live with the respondents brought to the training room. The interviews were conducted in Indonesian and local languages.

The questionnaire used in the field was written in the Indonesian language. The questionnaire consisted of closed- and open-ended questions, where questions on age, ethnicity, education, employment, monthly family income, and toothbrush frequency were the open-ended questions. Furthermore, the respondents' responses were classified based on the listed categories in the questionnaire paper sheets. The questionnaire was piloted in Plalangan village to 20 respondents to establish the validity and reliability of the survey instruments. The Cronbach's α for the questionnaire reliability was 0.815. All the protocol carried out in this study has been ethically reviewed and approved.

Statistical analysis

The statistical software SPSS for Windows version 25 was used to perform the analyses, and the variables of interest were checked for missing data. This study excluded all missing data from the analysis. Descriptive statistics of frequencies and percentages were carried out for every item in the questionnaire. A binary logistic regression was performed to find the determinants of dental pain

during the second wave of the COVID-19 pandemics. The independent variables were tested in one block to measure their predictive ability with a 95% confidence interval for the odds ratio, and the result was significant if $P < 0.05$.

Results

Table 1 shows the sociodemographic characteristics of respondents. Meanwhile, among a total of 396 participants, the majority were female (56.1%), and their ethnicity was Madurese (84.6%). The samples were in the 26–45 age group (49.2%), and only 5.6% were 66 years and older. The respondent's education level was mostly primary education or lower (54.5%), and only 3.3% had a higher level. The respondents were mainly farmers (48.2%), and their monthly income was reported less than 2 million IDR (83.8%). Subsequently, the majority of samples had health insurance (62.9%).

About 25.3% of respondents reported dental pain during the second wave of the pandemic. The respondents brushed their teeth twice or more in a day (87.15%) and ate sugary snacks twice or more in a day (69.2%), as presented in Table 2.

Table 1: Sociodemographic characteristics of respondents (n = 396)

Variable	n	%
Sex		
Male	174	43.9
Female	222	56.1
Age (years)		
17–25	57	14.4
26–45	196	49.5
46–55	70	17.7
56–65	51	12.9
66+	22	5.6
Ethnic		
Javanese	50	12.7
Madurese	335	84.6
Others	11	2.8
Education		
Primary or less	217	54.8
Middle school	70	17.7
High school	96	24.2
Higher education	13	3.3
Occupation		
Housewife	91	23.0
Farmer	191	48.2
Employee	40	10.1
Self-employed	53	13.4
Others	21	5.3
Monthly family income (IDR, million)		
<2	332	83.8
2–3	55	13.9
>3	9	2.3
Health insurance		
No	145	36.6
Yes	251	63.4

This study demonstrated that 29.3% of respondents felt the fear of the coronavirus infection. Table 3 showed that about 38.6% of participants received government support during the pandemic. In addition, during the interview period, 25.5% of respondents were vaccinated against COVID-19.

A binary logistic regression was conducted to identify the determinants of dental pain experienced during the second wave of the pandemic in a rural area in Indonesia with *a* $P < 0.05$. Table 4 showed that the model contained 12 independent variables. The full model containing the independent variables was statistically significant, X^2 (25, n = 396) = 40.97, P = 0.023, indicating that the model can differentiate between people with and without dental pain.

In this study, two independent variables made a statistically significant contribution to the model (age and fear on COVID-19). The "often" feeling of fear of coronavirus infection is the most significant predictor of dental pain (P = 0.004; odds ratio, OR = 5.23). Participants who reported "sometimes" on a feeling of fear of coronavirus were more likely to report dental pain than participants with "no" feeling of fear (P = 0.005; OR = 4.51). The older age groups were significantly associated with dental pain experience. Participants with age groups of 26–45 years (P = 0.036; OR = 3.47), 46–55 years (P = 0.026; OR = 4.19), and 56–65 years (P = 0.015; OR = 5.26) were more likely to report dental pain compared with participants in 17–25 years age group.

Discussion

The second wave of the COVID-19 pandemic raised concern about how people felt and the impacts on their daily life. This study conducted interviews among people in a rural area just after the peak period of the second wave of the COVID-19 pandemic in Indonesia to assess the prevalence of dental pain and its determinants based on sociodemographic, oral health behaviors, and response to COVID-19.

This study found that dental pain was reported by 25.3% of the respondents during the second wave of the pandemic. The prevalence of dental pain varied across the previous studies, ranging from 7% to 55%.[12,20,21] This distinction is related to the different methodological choices, age group investigated, area of study, and recall period of pain.

Age was the only sociodemographic characteristic found significantly related to dental pain on the logistic regression model. This study showed that adult age groups (26–65 years old) are more likely to report dental pain than the youngest age group (17–25 years old). A study in the United States also found that the age group was

a significant predictor of dental pain in a media social study during the COVID-19 pandemic, where older adults tweeted more on dental pain than the younger age group.[22] These findings may be related to the health literacy of the young adult, which promotes better oral health behavior and hence better oral health outcomes.[23] Another possible explanation is alterations of the salivary metabolome in the middle age group, resulting in tissue destruction, host defense mechanisms, and bacterial metabolism. However, the association between 66 years and older and dental pain in this present study was insignificant. The insignificant relationship may be due to tooth loss. The elderly had more tooth loss, where is less living space for bacteria that lead to less likely to report dental pain than the middle adult.[24]

Oral health-related behaviors examined in this study are toothbrushing frequency and sugary snack habits. This study showed that 96.2% of people brush their teeth every day, consisted for 87.1% brushed their teeth twice or more a day, and 9.1% brushed once a day. Compared with the national level survey in 2018, which showed 92.5% of people in the rural area of Indonesia brush their teeth every day, this study result is higher.[25] This result is also higher than a study in the Egyptian rural population (34.3%)[26] and Turkish society (48.4%),[5] who brush twice a day. This high percentage of toothbrush frequency may relate to the people's response to the pandemic when people were more aware of their health, proven by many prior studies that showed increasing toothbrush frequency during the pandemic.[5,21]

The consumption of sugary snacks in the participants' daily habits showed that most ate these snacks twice or more a day (69.2%). There was an increasing trend of snacking habits during the COVID-19 pandemics.[6,21] The restriction of community activities during the pandemic increased this sedentary behavior, which increased electronic device use that drives the snacking behavior. Another factor driving the snacking behavior is psychological problems because snacking was a coping strategy to deal with negative emotions.[27] In this study, oral health behaviors were insignificantly related to dental pain based on the multivariate analysis.

The fear of COVID-19 as a response to the pandemic was the most significant variable in this study. In this study, 86.6% of the respondent experienced the fear of coronavirus infection. The COVID-19 cases and death were at the highest number during the second wave of the pandemic (July–August 2021). The impacts of the COVID-19 pandemic on increasing anxiety and raising fears were investigated in several previous studies.[6,28,29] About 65% of parents reported a moderate and high level of fear in Brazil.[6] Although fear is a normal response in a pandemic

Table 2: Description of oral health-related questions (n = 396)

Question	n	%
Did you ever experience dental pain in the last 2 months (start on July 2021)?		
No	296	74.7
Yes	100	25.3
How many times do you brush your teeth in a day?		
Not every day	15	3.8
Once	36	9.1
Twice or more	345	87.1
How many times do you eat sugary snacks in a day (e.g., candy, chocolates, biscuits, etc.)?		
Not every day	36	9.1
Once	86	21.7
Twice or more	274	69.2

Table 3: Description of COVID-19 related questions (n = 396)

Question	n	%
Did you feel afraid that you would be infected with the coronavirus within the last 2 months?		
No	53	13.4
Sometimes	227	57.3
Often	116	29.3
Do you receive any forms of support from the government during the COVID-19 pandemic?		
No	243	61.4
Yes	153	38.6
Have you been vaccinated against COVID-19?		
No	295	74.5
Yes	101	25.5

Table 4: Descriptive statistic and binary logistic regression of the determinants of dental pain during the second wave of COVID-19 pandemic (n = 396)

	Dental pain experience		Binary logistic regression		
	No, n (%)	Yes, n (%)	Odds ratio	95% CI for OR	Significance
Sex					
Male (Ref)	127 (73.0)	47 (27.0)			
Female	169 (76.1)	53 (23.9)	0.72	0.40–1.28	0.260
Age (years)					
17–25 (Ref)	52 (91.2)	5 (8.8)			
26–45	149 (76.0)	47 (24.0)	3.47	1.09–11.11	0.036*
46–55	47 (67.1)	23 (32.9)	4.19	1.19–14.79	0.026*
56–65	33 (64.7)	18 (35.3)	5.26	1.39–19.93	0.015*
66+	15 (68.2)	7 (31.8)	3.87	0.84–17.77	0.082
Ethnic					
Javanese (Ref)	40 (80.0)	10 (20.0)			
Madurese	247 (73.7)	88 (26.3)	1.10	0.48–2.52	0.820
Others	9 (81.8)	2 (18.2)	1.55	0.23–10.32	0.651
Education					
Primary or less (Ref)	155 (71.4)	62 (28.6)			
Middle school	53 (75.7)	17 (24.3)	0.98	0.49–1.98	0.964
High school	77 (80.2)	19 (19.8)	1.16	0.56–2.35	0.691
Higher education	11 (84.6)	2 (15.4)	0.56	0.10–3.16	0.513
Occupation					
Housewife (Ref)	71 (78.0)	20 (22.0)			
Farmer	134 (70.2)	57 (29.8)	1.02	0.49–2.12	0.961
Employee	27 (67.5)	13 (32.5)	1.21	0.45–3.23	0.701
Self-employed	45 (84.9)	8 (15.1)	0.49	0.17–1.36	0.170
Others	19 (90.5)	2 (9.5)	0.59	0.10–3.51	0.563
Monthly family income (IDR, million)					
<2 (Ref)	249 (75.0)	83 (25.0)			
2–3	39 (70.9)	16 (29.1)	1.53	0.75–3.11	0.240
>3	8 (88.9)	1 (11.1)	0.35	0.04–3.09	0.343
Health insurance					
No (Ref)	107 (73.8)	38 (26.2)			
Yes	189 (75.3)	62 (24.7)	0.85	0.50–1.45	0.557
Toothbrush/day					
Not every day (Ref)	9 (60.0)	6 (40.0)			
Once	23 (63.9)	13 (36.1)	0.50	0.12–2.14	0.352
Twice or more	264 (76.5)	81 (23.5)	0.33	0.09–1.23	0.103
Sugary snack/day					
Not every day (Ref)	27 (75.0)	9 (25.0)			
Once	67 (77.9)	19 (22.1)	0.61	0.22–1.68	0.337
Twice or more	202 (73.7)	72 (26.3)	0.70	0.29–1.72	0.440
Fear of corona infection					
Never (Ref)	48 (90.6)	5 (9.4)			
Sometimes	165 (72.7)	62 (27.3)	4.51	1.56–13.04	0.005*
Often	83 (71.6)	33 (28.4)	5.23	1.69–16.14	0.004*
Government support					
No (Ref)	192 (79.0)	51 (21.0)			
Yes	104 (68.0)	49 (32.0)	1.47	0.88–2.45	0.138
Vaccination status					
No (Ref)	220 (74.6)	75 (25.4)			
Yes	76 (75.2)	25 (24.8)	1.25	0.68–2.31	0.480

CI = confidence interval, Ref = reference category

*Significance, $P < 0.05$

situation, high levels of fear trigger psychological distress that influences health outcomes and the quality of life.[28]

The multivariate analysis demonstrated that the feeling of fear of coronavirus infection is a significant predictor of dental pain in this study. Furthermore, the respondents who experienced fear of the infection were more likely to report dental pain than those who did not. This result is in line with the study by Matsuyama *et al.*[30] in Japan, which showed a significant relationship between psychological distress and dental pain during the COVID-19 pandemic. Also, previous studies identified the relationship between stress level and oral health, where the higher the stress level, the more severe the oral health status.[8] Stress contributes to oral disease development because it may lead to sedentary behavior, including laziness to maintain oral hygiene and poor diet. Also, it affects the immune system and influences the mechanisms of disease progression.[8]

This study gives a better understanding of how the second wave of the COVID-19 pandemic impacted the rural population's oral health. Oral health, which is a part of general health, is an important aspect of life and affects the quality of life. People often complain about dental pain as a signal of oral health problems. In this COVID-19 pandemic, the oral condition worsens the general health and may influence the irresistibility.

There are some limitations of this study due to the nature of this research. This study is a cross-sectional survey limiting causal inference between dental pain and the independent variables. Because this study asked respondents about dental pain experience lasting 2 months, respondents may mention the wrong answer. In addition, further study may use an index to measure the dental pain associated with COVID to enhance the significant result of the study.

Conclusion

This study highlights the importance of psychological factors on oral health outcomes and attention for the older age groups on oral health during this COVID-19 pandemic. Broader and integrated approaches concerning these factors should be considered in developing oral health programs for the rural population.

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Conflicts of interest

There are no conflicts of interest.

Author contributions

EAAM contributed to conception, design, and interpretation and drafted the article; RWEY contributed to data collection and interpretation and revised the article; K contributed to design and drafted and revised the article; ATWH contributed to conception and design; HH contributed to interpretation and critically revised the article; SM contributed to data collection.

Ethical policy and institutional review board statement

The protocol of the study was approved by the Ethical Committee of Medical Research, Faculty of Dentistry with code no. 1256/UN25.8/KEPK/DL/2021. All the procedures have been performed as per the ethical guidelines laid down by Declaration of Helsinki (1975).

Patient declaration of consent

Participants involved in the study signed informed consent before conducting the interview.

Data availability statement

The data of this study are available upon request to the corresponding author.

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